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JAN 11 2001

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Dear Mr. Lister and Ms. Logan:

**SUBJECT: BROOKHAVEN NATIONAL LABORATORY (BNL) INTERAGENCY
AGREEMENT (IAG): BROOKHAVEN GRAPHITE RESEARCH REACTOR
(BGRR)**

Enclosed please find the final Action Memorandum for the BGRR Canal and Water Treatment House Removal Action dated January 5, 2001. This document will be entered into the BNL Administrative Record by the end of January.

If you should have any questions, please call Gail Penny of my staff at (631) 344-3429.

Sincerely,

Michael D. Holland
Brookhaven Group Manager

Enclosure:
As stated

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ACTION MEMORANDUM

BROOKHAVEN GRAPHITE RESEARCH REACTOR CANAL AND WATER TREATMENT HOUSE REMOVAL ACTION

January 5, 2001

Prepared by
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Prepared for
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ACRONYMS, ABBREVIATIONS, AND UNITS OF MEASURE

Ac-227	Actinium-227
ALARA	as low as reasonably achievable
AOC	Area of Concern
ARARs	Applicable or Relevant and Appropriate Requirements
BGRR	Brookhaven Graphite Research Reactor
Bldg.	building
BNL	Brookhaven National Laboratory
BSA	Brookhaven Science Associates
CERCLA	<i>Comprehensive Environmental Response, Compensation, and Liability Act</i>
CFR	<i>Code of Federal Regulations</i>
cm	centimeter(s)
cm ²	square centimeters
CMU	concrete masonry unit
Cs-137	Cesium-137
D&D	decontamination and decommissioning
DOE	U.S. Department of Energy
dpm	disintegrations per minute
EPA	U.S. Environmental Protection Agency
I-129	Iodine-129
ISOCS	<i>In-situ</i> Object Counting System
MDA	Minimum Detectable Activity
mR/hr	milliRoentgen per hour
mrem/hr	millirem per hour
NCP	<i>National Contingency Plan</i>
NESHAP	National Emission Standards for Hazardous Air Pollutants
NYCRR	New York Codes, Rules and Regulations
NYSDEC	New York State Department of Environmental Conservation
Pa-231	Protactinium-231
pCi/g	picoCuries per gram
Ra-226	Radium-226
Ra-228	Radium-228
RCRA	<i>Resource Conservation and Recovery Act</i>
rem	Roentgen equivalent man
rem/hr	rem per hour
Sr-90	Strontium-90
Th-228	Thorium-228
Th-230	Thorium-230

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I. PURPOSE

The purpose of this Action Memorandum is to document the decision by the U.S. Department of Energy (DOE) to conduct a time-critical removal action to remove the Canal and Water Treatment House above-grade structures. This removal action includes the above-ground equipment, walls, roof, and super structures of the Canal House and Water Treatment House, Buildings 901 and 901A, respectively, at Brookhaven National Laboratory (BNL).

This action is being undertaken as a time-critical removal action in accordance with the Interagency Agreement (IAG) between the DOE, the U.S. Environmental Protection Agency (EPA), the New York State Department of Environmental Conservation (NYSDEC). This action will be consistent with the final remedial actions that will be documented in the Brookhaven Graphite Research Reactor (BGRR) Record of Decision. Work will be conducted in accordance with the *National Contingency Plan* [1].

II. SITE CONDITIONS AND BACKGROUND

A. Site

1. Physical Location

Brookhaven National Laboratory is located in Upton, Suffolk County, New York, near the geographic center of Long Island (Figure 1). The site encompasses 5,300 acres, 75 percent of which is wooded. The remainder is developed and contains office buildings, various large research facilities, and parking lots. The BNL site, formerly occupied by the U.S. Army as Camp Upton during World Wars I and II, was transferred to the Atomic Energy Commission in 1947, to the Energy Research and Development Administration in 1975, and to the Department of Energy in 1977. It has been used as a national laboratory since 1947. The BNL site is owned by the DOE and is operated by Brookhaven Science Associates (BSA).

Brookhaven National Laboratory carries out basic and applied research in the following fields: high-energy nuclear physics and solid-state physics, fundamental material and structure properties and the interaction of matter nuclear medicine, biomedical and environmental sciences, and, selected energy technologies. Major operating facilities include the Relativistic Heavy Ion Collider, the National Synchrotron Light Source, and the Alternating Gradient Synchrotron.

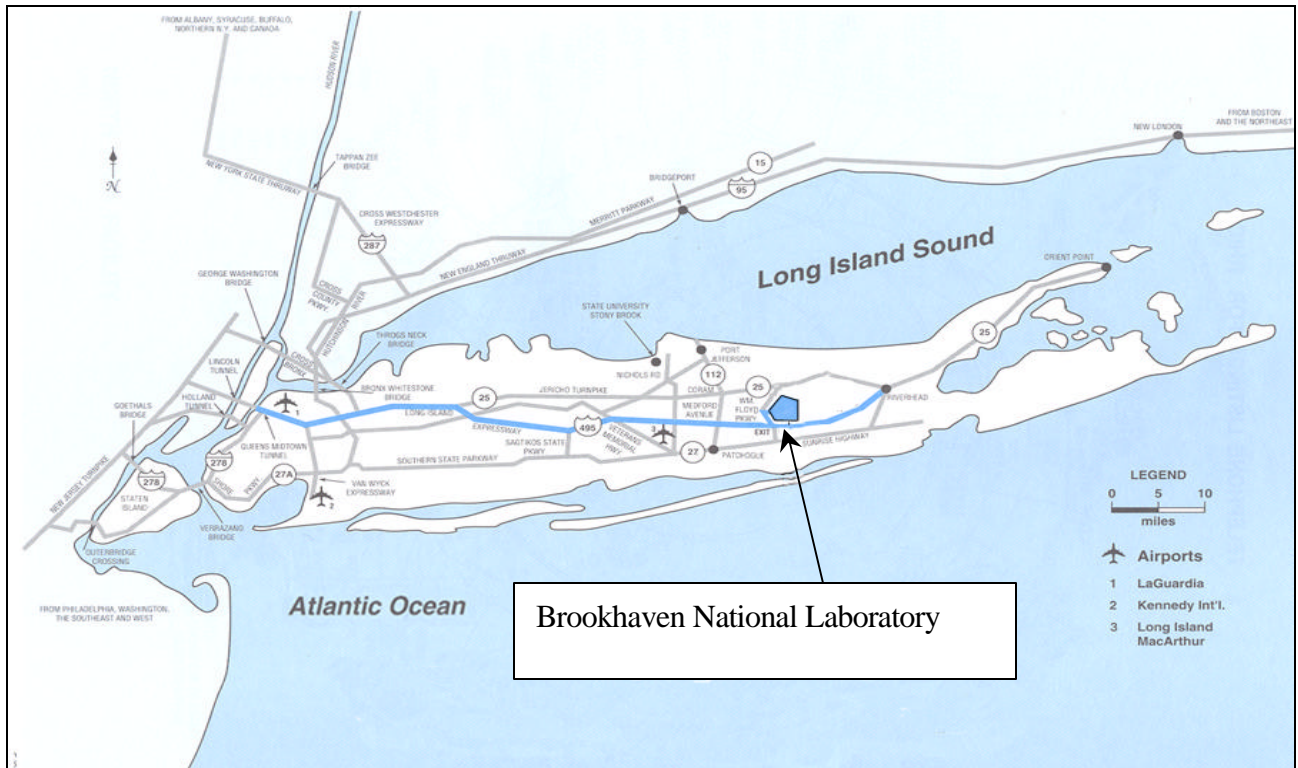


Figure 1. Location of Brookhaven National Laboratory

2. Removal Site Evaluation

This removal action concerns low-level radioactive contamination in the Canal and Water Treatment House inside structures, equipment, walls, and roof (Figure 2). The Canal House structure is a beam super-structure with cemesto (an asbestos-containing material) sheet siding and a flat built-up roof made from asbestos-containing insulation material, tar paper, tar, and a gravel top layer. The Water Treatment House is a concrete block building that was added and attached when it was determined necessary to add additional filtration equipment for filtering the canal water to the north of the canal building. It also has a flat built-up roof (Figure 3).

Previously identified surface contamination adjacent to and around the Canal and Water Treatment House was documented in 1998 as part of a routine monitoring radioactive surface survey of the asphalt area. At that time, the asphalt had surface cracking. The elevated contamination areas were marked, and the area was resurfaced with a fresh layer of asphalt to prevent rainwater from washing contamination deeper into the soil. This site is designated Area of Concern (AOC) 9C [2].

During the characterization of the area under the canal, a building joint/seam was identified as a potential source for a Strontium-90 groundwater plume in the area. Additionally, hand auger soil samples taken of the soil under the canal near the joint/seam and near the east yard sump

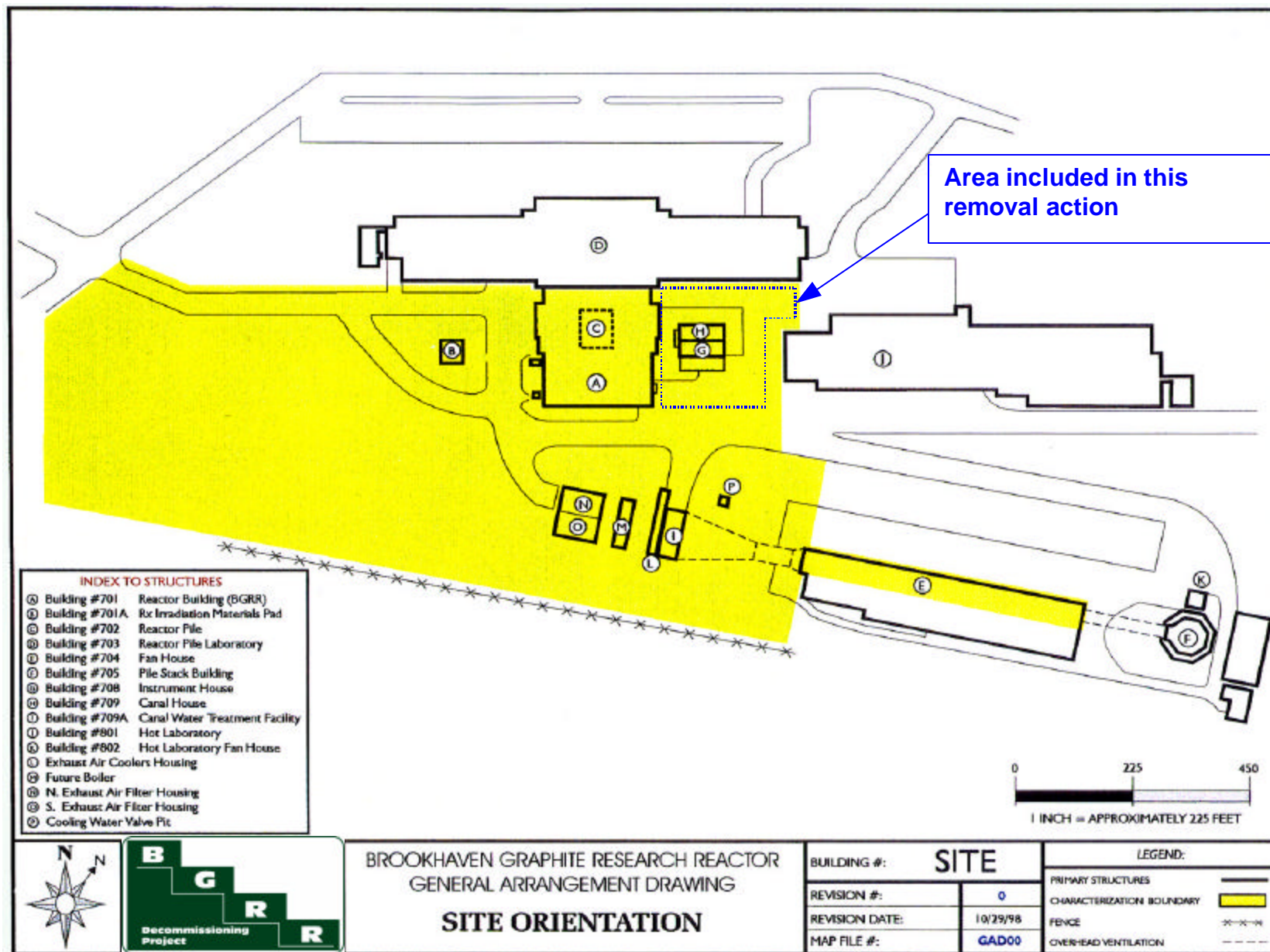


Figure 2. BGRR facility plan showing area of removal action



Figure 3. Photograph of Canal and Water Treatment House

indicated Cesium-137 in the soil at levels between 24 and 4,400 picoCuries per gram (pCi/g) as measured using an *In-situ* Object Counting System (ISOCs), field laboratory equipment. Cesium and Strontium are both products of the thermal fission process, which took place in the graphite pile uranium fuel.

3. Release or Threat of Release into the Environment of a Hazardous Substance, Pollutant, or Contaminant

The Canal and Water Treatment House structure is contaminated internally. According to a 1995 general area radiological survey, dose rates of 1 millirem per hour (mrem/hr) with smearable alpha contamination on the floor of 150,000 disintegrations per minute (dpm) per 100 square centimeters (cm²). This range of smearable alpha contamination requires workers to be in respirators before accessing the area. The canal joint was known to have leaked during BGRR operations. According to operations records, the canal was drained and the joint repaired in 1963. The final draining of the canal took place in 1972, but some time later water leaked from a chiller cooling pipe into the walkway and canal. Rainwater collected at a rate of 750 gallons for every inch of rainfall in the contaminated bermed area adjacent to the canal and drained into the east yard sump before draining to the waste tanks in the basement of Building 801. This condition leaked radioactively contaminated water to the adjacent soil column. Elevated levels of Cesium-137 contamination were found at depths to 14 feet below grade level near the east yard sump. The rainwater intrusion problem was discovered in 1997; the bermed area was covered with a plastic covering, filled with dirt, and finally capped with asphalt to preclude rainwater draining into the east yard sump.

Appendix 1, "Canal and Water Treatment House Radiological Surveys," provides the survey data information that has been compiled for the Canal and Water Treatment House interior and exterior surveys.

B. Other Actions to Date

1. Previous Actions

The canal area was inspected in August 1998 for water intrusion. The canal general area, inside and outside of the canal, was surveyed at that time. The general area exposure rate was 2 mR/hr with the highest contact measurement of 15 mR/hr. Water and sludge were removed from the canal walkway sump in 1999. In 2000, the contaminated interior of the Canal House was coated with a fixative to reduce the loose surface contamination to levels below those necessary for worker respirator protection for entry. Several canal covers were removed and the loose surface contamination in the canal was coated with a fixative. This allowed characterization of the canal concrete and soil below the canal.

2. Ongoing Action

The core bores installed in the parking area for characterization of the surface and deep soil below the asphalt and concrete have been sealed to prevent rainwater from moving onto the soil and potentially moving contaminants deeper into the soil. The canal, canal house walkway sump, and the east yard sump are not being used to support any current activities. The Canal and Water Treatment House surrounding areas are posted as a radiological controlled area, fixed contamination area, and underground radioactive material.

3. Planned Actions

The above ground portions of the Canal and Water Treatment House will be removed using standard radiological and deconstruction techniques. Debris will be segregated into contaminated and non-contaminated materials and be disposed of accordingly at licensed disposal facilities or landfills respectively. A containment structure will be erected over areas of the Canal and Water Treatment House to allow for the dismantlement of the structure and to prevent rainwater from entering the canal and the foundation of the Water Treatment House.

C. National Priorities List Status

Brookhaven National Laboratory was added to the National Priorities List in 1989. An IAG under the *Comprehensive Environmental Response, Compensation and Liability Act* (CERCLA), and applicable New York State regulations was negotiated between DOE, the EPA, and NYSDEC. The IAG became effective in May 1992, and controls the environmental restoration program at BNL.

III. THREATS TO PUBLIC HEALTH OR WELFARE AND THE ENVIRONMENT: STATUTORY AND REGULATORY AUTHORITIES

A. Threats to Public Health or Welfare

Characterization activities conducted at the Canal and Water Treatment House have indicated that these facilities are contaminated with radionuclides from historical operations as indicated in Appendix 1. The Canal and Water Treatment House and surrounding areas are posted as a radiological controlled area, and contain fixed contamination. No future use is planned for these facilities. Removal and disposal of contaminated materials will reduce the potential for the spread of contamination and associated impacts to on-site workers.

B. Threats to the Environment

The major threat to the environment is on-site migration of contaminants into surrounding soils.

IV. DETERMINATION OF ENDANGERMENT

If actual or threatened releases of pollutants and contaminants from this site are not mitigated by taking the response action selected in this action memorandum, they pose imminent and substantial endangerment to the environment.

V. PROPOSED ACTION AND ESTIMATED COSTS

A. Proposed Action

1. Proposed Action Description

The proposed action is to remove the Canal and Water Treatment House structures to ground level. The planned work will be conducted in accordance with the Applicable or Relevant and Appropriate Requirements (ARARs) addressed in section V.4. The structures, concrete, and associated piping will be removed and disposed of in accordance with appropriate Federal and State regulations. This removal action is being undertaken to prevent additional contamination from migrating into surrounding soils and groundwater and to allow access to the below grade canal area.

All criteria required by DOE Order 435 "Radioactive Waste Management" [3] shall be met during this action. All waste will be disposed of off site in an approved waste facility, which meets all Federal and State requirements. The exact disposal location will be based on final waste designation.

2. Contribution to Remedial Performance

The BGRR Decommissioning Project will address AOC 9 through several removal actions under the "Policy on Decommissioning Department of Energy Facilities Under CERCLA" [4]. In the future, a Record of Decision will be developed to document the long-term closeout of AOC 9 based on the results of these actions undertaken as part of the BGRR Project. The proposed removal action addresses source removal, and therefore is consistent with, and contributes to, the long-term objectives of the Record of Decision for AOC 9.

3. Description of Alternative Technologies

Because the Canal and Water Treatment House interior surfaces are contaminated with radioactivity and hazardous materials, the number of practical and suitable treatments that can be applied are limited.

Project planning for the removal of the Canal and Water Treatment House structures included a review of some typical deconstruction techniques:

1. Mechanical cutting and flame cutting of structural steel
2. Rubblizing the concrete block portions of the water treatment house and cemesto panel portions of the Canal House
3. Containment controls available to prevent the spread of contamination
4. Diamond wire cutting of concrete block walls
5. Fixative application to fix in place loose surface contamination

Flame cutting of contaminated steel can produce airborne contamination making it more difficult to control, and is therefore less desirable than mechanical saw cutting. Contamination control of cutting fines from mechanical saw cutting is easier to control than the airborne contamination created by flame cutting. Flame cutting will be limited to non-contaminated portions of the structure.

The two roofs of the Canal and Water Treatment House are flat built-up materials. The roofs are not radioactively contaminated. The roofing materials will be removed by a roofing contractor qualified to handle asbestos roofing materials and will be disposed of as asbestos-containing materials at an off-site landfill.

To prevent the spread of contamination during the removal of the building walls and roof structure, a temporary weather-tight enclosure will be erected over the work site. This temporary structure will be designed and constructed using accepted commercial standards and materials for such structures. Qualified suppliers shall be solicited to provide this structure which, will most likely be a metal-framed design with a polymer exterior covering.

The Water Treatment House concrete block walls and roof will be demolished using a mechanical ram and a backhoe or other suitable construction equipment. Since the building is constructed of standard concrete masonry unit (CMU), the majority of the demolition breaks will occur at the CMU mortar joints, thereby minimizing dust and debris. A commercially available coating material will be used to coat the interior sections of the block to fix any loose surface contamination to prevent the spread of contamination. Diamond-wire cutting is most efficient on poured reinforced concrete structures; it will not be used on the concrete block.

The cemento walls of the Canal House will be prepared for dismantlement by applying a fixative to the interior walls. The wall is constructed of asbestos-containing material and will be dismantled to reduce the potential for the asbestos to become friable. The removed cemento will be bagged and placed into containers for off-site disposal.

The remaining steel super-structure of the Canal House will be removed by mechanical cutting, cut to size for packaging, and transported to an off-site disposal facility.

Non-contaminated materials removed during the dismantlement will be disposed at approved off-site landfills that accept construction debris. The contaminated materials removed will be packaged and disposed at an approved disposal facility.

4. Applicable or Relevant and Appropriate Requirements

The National Contingency Plan [1] Section 300.430 (e)(9)(iii)(B) requires that the selected remedy attains the requirements set by Federal and State ARARs or that a waiver of an ARAR is obtained. This removal action will meet the following ARARs to the extent practicable.

Chemical-Specific ARARs

The chemical-specific ARARs that the Removal Action will meet are listed below:

1. 6 NYCRR 212 [5], General Process Emission Sources: This State regulation will be followed to determine the need for air-emission control equipment.
2. *Resource Conservation and Recovery Act (RCRA)* (40 CFR 260-268) [6]: These Federal regulations define hazardous wastes. All wastes classified as hazardous will be handled, stored, and disposed of off-site at a permitted facility in accordance with these regulations.
3. New York State Hazardous Waste Regulations (6 New York Codes, Rules and Regulations [NYCRR] 370 - 373) [7]: These regulations define hazardous wastes in New York State. All wastes classified as hazardous will be handled, stored, and disposed of off-site at a permitted facility in accordance with these regulations.

Location-Specific ARARs

No location-specific ARARs were identified.

Action-Specific ARARs

The action-specific ARARs that this Removal Action will meet are listed below:

1. 10 CFR 835 [8]: This regulation establishes the requirements for controlling and managing radiologically contaminated areas at DOE sites.
2. RCRA (40 CFR 260-268): As described above.
3. New York State Hazardous Waste Regulations (6 NYCRR 370 - 373): As described above.
4. *Clear Air Act* (42 U.S.C. Section 7401, et seq.) [9] and National Emissions Standards for Hazardous Air Pollutants (NESHAP) (40 CFR 61) [10]: This Act regulates and limits the emissions of hazardous air pollutants, including radionuclides.

To Be Considered Guidance

In implementing this Removal Action, the following important guidance will be considered:

1. NYSDEC's Division of Air Guidelines for Control of Toxic Ambient Air Contaminants, Air Guide 1: This guide will be used to assess the impacts of air emissions and to assist with evaluating the need for having air-emissions control equipment.
2. DOE Order 435 "Radioactive Waste Management" [3]: This order provides guidance and requirements for management and disposal of radioactive waste generated at DOE facilities.
3. As Low As Reasonably Achievable (ALARA): The approach to radiation protection to manage and control exposures (both individual and collective) to the work force and to the general public, to levels as low as is reasonable, taking into account social, technical, economic, practical, and public policy considerations. ALARA is a concept and a process that has the objective of attaining (and maintaining, if achieved) doses as far as possible below the applicable limits of 10 CFR 835 [8].

5. Project Schedule

Removal of the Canal and Water Treatment House is scheduled for January through March of 2001.

6. Estimated Costs

The estimated cost is approximately \$450,000.

VI. EXPECTED CHANGE IN THE SITUATION SHOULD ACTION BE DELAYED OR NOT TAKEN

A delayed action or no action will increase the potential for the contaminants to migrate deeper into the soil column, as well as to increase uptake by local fauna and flora. Delaying action will potentially increase the scope and cost of the project as larger volumes of soil may potentially become affected.

VII. PUBLIC PARTICIPATION

Public participation for the Canal and Water Treatment House Removal Action includes issuing a public notice. This activity will coincide with the submission of this Action Memorandum to the Administrative Record. The BGRR Working Group meeting scheduled for October 17, 2000 discussed work on the Canal and Water Treatment House Removal Action, and discussion will continue at the group's monthly meetings. Once this Action Memorandum has been issued, a public notice of its availability will be published in *Newsday* (regional distribution) and in *Suffolk Life*. Simultaneously, a copy of the public notice will be placed on the BNL's Environmental Restoration Division website.

VIII. OUTSTANDING POLICY ISSUES

The future use of the BGRR land has not been determined.

IX. ENFORCEMENT

The site is owned by DOE and operated for DOE by BSA. The DOE will fund the source control disposal entirely. The Removal Action will be conducted in accordance with CERCLA and National Contingency Plan requirements, the IAG Executive Order 12580 [11], applicable New York State regulations, and Suffolk County Sanitary Code, Article 12.

X. RECOMMENDATION

This decision document recommends the removal action of the Canal and Water Treatment House. The Removal Action includes the structures which are contaminated with hazardous and radioactive materials. This action was developed in accordance with CERCLA as amended, and is consistent with the National Contingency Plan.

XI. REFERENCES

1. 40 Code of Federal Regulations (CFR) 300, National Oil and Hazardous Substances Pollution Contingency Plan.
2. Letter from Mary Logan (EPA) to G. Malosh (DOE/BHG), Subject: Brookhaven National Laboratory, BGRR (letter dated 3/23/99).
3. DOE Order 435 "Radioactive Waste Management."
4. "Policy on Decommissioning Department of Energy Facilities Under CERCLA" (dated 5/22/95).
5. New York State General Process Emissions Sources, 6 NYCRR 212.
6. 40 CFR 260-268, Hazardous Waste Management System (RCRA).
7. New York State Hazardous Waste Regulations (6 NYCRR 370 - 373).
8. 10 CFR 835, Occupational Radiation Protection.
9. *Clear Air Act* (42 U.S.C. Section 7401, et seq.).
10. National Emissions Standards for Hazardous Air Pollutants (40 CFR 61).
11. Interagency Agreement Executive Order 12580.
12. Brookhaven National Laboratory, Radiological Control Manual, Rev. 3.

Appendix 1

Canal and Water Treatment House Radiological Surveys

The table in this appendix provides a summary of the radiological data identified during surveys of the exterior and interior areas of the Canal and Water Treatment House. The criteria for the different types of area classifications and uncontrolled releases, as prescribed in the BNL Radiological Control Manual [12] is provided in the table for reference.

Prior to performing any cleanup or characterization operations on the inside of the Canal and Water Treatment House interior, the areas were controlled with periodic monitoring, using standard radiological postings to warn personnel of identified hazards. Personnel entry required the use of protective clothing and respirators to protect against external personnel contamination and inhalation of the air borne radioactivity, respectively.

Decontamination and decommissioning (D&D) workers wiped down the accessible areas, removed loose flaking paint, debris, and vacuumed. Following the cleanup, a fixative was applied to the floors and walls to stabilize the removable contamination. The follow-up surveys demonstrated that the cleanup and fixative application was effective. Very little alpha and beta contamination is detectable because it is stabilized by the application of the coating. The area remains under control, but the requirements for general entry now do not require the use of respirators.

Survey Area Description	BNL Guidelines from BNL Radiological Control Manual	Survey Date	Survey Results (range)	Comments
Boundary area 15 to 20 feet from the Canal and Water Treatment House	"Table 2-3 Criteria for Posting Radiation Areas" Radiation Area >0.0005 rem/hr and < 0.1 rem/hr at 30 cm	4-15-98 Bldg. 709 outside of building	0.000011 rem/hr to 0.000035 rem/hr gamma	Prior to any cleanup attempts
Canal and Water Treatment House exterior wall contact readings	"Table 2-3 Criteria for Posting Radiation Areas" Radiation Area >0.0005 rem/hr and < 0.1 rem/hr at 30 cm	4-15-98 Bldg. 709 outside of building	0.000030 rem/hr to 0.000300 rem/hr gamma	Prior to any cleanup attempts
Canal Walkway area inside of building	"Table 2-3 Criteria for Posting Radiation Areas" Radiation Area >0.0005 rem/hr and < 0.1 rem/hr at 30 cm	5-26-99 Bldg. 709 inside of building Survey #99-101	0.006 rem/hr to 0.016 rem/hr gamma 0.0066 to 1.1 rad/hr beta	Prior to any cleanup attempts
Canal Walkway area inside of building	"Table 2-2 Definition of Removable and Fixed Contamination Levels" Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above. Includes mixed fission products containing Sr-90. Removable 1,000 dpm/100 cm ² beta-gamma Fixed plus Removable 5,000 dpm/100 cm ² beta-gamma	5-26-99 Bldg. 709 inside of building Survey #99-101	10,000 to 200,000 dpm/100 cm ² beta	Prior to any cleanup attempts
Canal Walkway area inside of building	"Table 2-2 Definition of Removable and Fixed Contamination Levels" (Most limiting) Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-129. Removable 20 dpm/100 cm ² alpha Fixed plus Removable 500 dpm/100 cm ² alpha	8-8-97 Bldg. 709 inside of building survey	< Minimum Detectable Activity (MDA) to 363 dpm/100 cm ² alpha	Prior to any cleanup attempts

Survey Area Description	BNL Guidelines from BNL Radiological Control Manual	Survey Date	Survey Results (range)	Comments
Canal Walkway area inside of building	“Table 2-3 Criteria for Posting Radiation Areas” Radiation Area >0.0005 rem/hr and < 0.1 rem/hr at 30 cm	3-8-00 Bldg. 709 inside of building Survey #180	0.0002 rem/hr to 0.006 rem/hr gamma up to 0.056 rad/hr beta	Post-cleanup survey
Canal Walkway area inside of building	“Table 2-2 Definition of Removable and Fixed Contamination Levels” Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above. Includes mixed fission products containing Sr-90. Removable 1,000 dpm/100 cm ² beta-gamma Fixed plus Removable 5,000 dpm/100 cm ² beta-gamma	3-8-00 Bldg. 709 inside of building Survey #180	2,000 to 16,000 dpm/100 cm ² beta-gamma No alpha survey performed.	Post-cleanup survey

Survey Area Description	BNL Guidelines from BNL Radiological Control Manual	Survey Date	Survey Results (range)	Comments
Canal House interior	“Table 2-3 Criteria for Posting Radiation Areas” Radiation Area >0.0005 rem/hr and < 0.1 rem/hr at 30 cm.	3-10-00 Bldg. 709 inside of building Survey #00-202	0.000020 rem/hr to 0.005 rem/hr gamma 0.060 to 0.160 rad/hr. beta	Post-cleanup survey
Canal House interior	“Table 2-2 Definition of Removable and Fixed Contamination Levels” Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above. Includes mixed fission products containing Sr-90. Removable 1,000 dpm/100 cm ² beta-gamma Fixed plus Removable 5,000 dpm/100 cm ² beta-gamma	3-10-00 Bldg. 709 inside of building Survey #00-202	< 1,000 to 60,000 dpm/100 cm ² beta	Post-cleanup survey
Canal House interior	“Table 2-2 Definition of Removable and Fixed Contamination Levels” (Most limiting) Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-129. Removable 20 dpm/100 cm ² alpha Fixed plus Removable 500 dpm/100 cm ² alpha	3-10-00 Bldg. 709 inside of building Survey #00-202	< MDA to 16 dpm/100 cm ² alpha	Post-cleanup survey

Survey Area Description	BNL Guidelines from BNL Radiological Control Manual	Survey Date	Survey Results (range)	Comments
Water Treatment House interior	“Table 2-3 Criteria for Posting Radiation Areas” Radiation Area >0.0005 rem/hr and < 0.1 rem/hr at 30 cm.	5-12-00 Bldg. 709A inside of building Survey #00-95	0.0001 rem/hr. to 0.012 rem/hr gamma 0.016 to 0.360 rad/hr. beta	Prior to any cleanup attempts
Water Treatment House interior	“Table 2-2 Definition of Removable and Fixed Contamination Levels” Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above. Includes mixed fission products containing Sr-90. Removable 1,000 dpm/100 cm ² beta-gamma Fixed plus removable 5,000 dpm/100 cm ² beta-gamma	5-12-00 Bldg. 709A inside of building Survey #00-320	< 5,500 to 180,000 dpm/100 cm ² beta-gamma < MDA to 3,516 dpm/100 cm ² beta	Prior to any cleanup attempts
Water Treatment House interior	“Table 2-2 Definition of Removable and Fixed Contamination Levels” (most limiting) Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-129. Removable 20 dpm/100 cm ² alpha Fixed plus removable 500 dpm/100 cm ² alpha	5-12-00 Bldg. 709A inside of building Survey #00-320	< MDA to 32 dpm/100 cm ² alpha	Prior to any cleanup attempts

Survey Area Description	BNL Guidelines from BNL Radiological Control Manual	Survey Date	Survey Results (range)	Comments
Water Treatment House interior	“Table 2-3 Criteria for Posting Radiation Areas” Radiation Area >0.0005 rem/hr and < 0.1 rem/hr at 30 cm.	5-23-00 Bldg. 709 inside of building Survey #00-334	0.001 rem/hr to 0.005 rem/hr gamma	Post-cleanup survey
Water Treatment House interior	“Table 2-2 Definition of Removable and Fixed Contamination Levels” Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above. Includes mixed fission products containing Sr-90. Removable 1,000 dpm/100 cm ² beta-gamma Fixed plus Removable 5,000 dpm/100 cm ² beta-gamma	5-23-00 Bldg. 709 inside of building Survey #00-334	< 29 to 499 dpm/100 cm ² beta	Post-cleanup survey
Water Treatment House interior	“Table 2-2 Definition of Removable and Fixed Contamination Levels” (Most limiting) Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-129. Removable 20 dpm/100 cm ² alpha Fixed plus Removable 500 dpm/100 cm ² alpha	5-12-00 Bldg. 709A inside of building Survey #00-334	< MDA dpm/100 cm ² alpha	Post-cleanup survey